

SHAPE EVOLUTION IN THE NEUTRON-DEFICIENT LEAD ISOTOPES MEASURED BY IN-SOURCE LASER SPECTROSCOPY

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Mean-square charge radii and magnetic moments have been measured for the neutron-deficient lead isotopes, ¹⁸³⁻¹⁸⁸Pb.

The measurement was performed at the ISOLDE online mass separator, using the in-source laser spectroscopy technique. The laser wavelength of the first excitation step in the resonance ionization laser ion source (RILIS) [e.g. 1] is scanned over the resonance(s) and the α -line intensity of the Pb α -decay is monitored as a function of the wavelength. The isotope shift and, in the case of odd-A isotopes, the hyperfine splitting are deduced. As a test case ¹⁹⁰Pb was remeasured: good agreement was obtained with the earlier, collinear laser spectroscopy measurement of Dutta et al. [2].

The observed behaviour of the rms-charge radii as a function of the mass, follows the smooth trend of the heavier isotopes, down to and even below the neutron mid-shell at N=104. This finding evidences a spherical shape of the lead ground states and a limited mixing with the deformed configurations, present at higher energy in the excitation scheme.

Intensive improvements of the laser frequency stabilization have been made and resulted in an improved reliability of this technique. In combination with its large sensitivity, this technique has become a very efficient alternative in atomic spectroscopy measurements, especially in the regions of heavy nuclei furthest away from stability, where the isotope production steeply drops.

1. V.F. Fedoseyev, Hyp. Int. 127 (2000) 409
2. S.B. Dutta et al., Zeit. für Phys. A 341 (1991) 39